

## **AUDIO VISUAL SYSTEM AND APPARATUS**

### **FIELD OF THE INVENTION**

[0001] This invention relates to furniture, and more particularly to audio visual systems that can be used in a home or an office environment. For example, the audio visual system can be an entertainment center.

### **BACKGROUND OF THE INVENTION**

[0002] Entertainment centers are one type of audio visual system that typically include a plurality of audio visual components including any number or all of the following: a television, speakers, a receiver, a VCR, a CD player, a DVD player, a personal video recorder (PVR), and TIVO type products. These systems have been available in a variety of sizes, shapes, and styles. For example, a television, receiver, VCR, and CD and DVD players can be housed in a cabinet having additional shelves and/or drawers to store other items such as books, remote controls, video recordings, CDs, and DVDs. Some entertainment centers are open in the front, while others have doors that conceal some or all of the components from view.

[0003] There remains a need to improve audio visual or home entertainment systems to be more suitable for space-limited environments in the office or home where, for example, there may not be the desired amount of room for floor standing speakers. Also, there is a need to provide systems that provide space saving storage for speakers.

### **SUMMARY OF THE INVENTION**

[0004] The present invention involves improvements in audio visual systems and avoids disadvantages of the prior art.

[0005] In one embodiment, an audio visual system is provided comprising a housing having a front wall, a video display, at least one speaker support coupled to the housing, and at least one speaker mounted to and supported by the speaker support. The speaker has a front and a rear wall, and the speaker support is movable with the speaker mounted thereto from a first state, where the front of the

speaker is behind a portion of the housing so that the front is hidden from view when viewing the front wall of the housing, to a second state, where the speaker is spaced from the housing and the front of the speaker is unobstructed thereby.

[0006] With this construction, the speakers can be hidden from view when the system is not in use. However, in use, the speakers can be extended from the housing, which can be in the form of a cabinet or armoire, a distance to improve stereophonic sound reproduction and/or distribution within the room in which the system is placed. The distance between the speakers and the housing or cabinet can be adjusted to achieve the optimum sound to the listener within the given area.

[0007] Not only does the hidden aspect improve the appearance of the system when not in use, the hidden aspect can provide speaker protection. First, the housing can provide dust protection for the speakers. Further, the portion of the housing or cabinet behind which the speakers are disposed can be constructed to prevent or minimize the possibility of sharp objects or fluids, such as cleaning fluids, from passing therethrough, through the speaker covers, and into the speaker component(s) such as the speaker cone. Otherwise such sharp objects or fluids could damage the speakers and cause deterioration of the speaker's sound reproductive quality. The portion of the housing in front of the speakers also can be constructed of suitable material to protect the speakers from pets and potential clawing of the speaker fabric, which can result in tearing the fabric and then damage to the speaker components.

[0008] According to another embodiment of the invention, an audio visual system is provided comprising a housing having a front wall, a video display, at least one speaker support coupled to the housing, and at least one speaker suspended from the speaker support, the speaker having a front and a rear wall, and the speaker support being movable with the speaker suspended therefrom, the speaker support comprising an extensible member, which can be, for example, a telescoping arm or sliding rail. The extensible arms provide a simple mechanism to spread out the sound field.

[0009] According to another embodiment of the invention, an audio visual system is provided comprising a housing having a front wall, a video display, at least one speaker box support coupled to the housing, and at least one speaker box forming a space adapted to receive another speaker box, the at least one speaker box being

mounted to and supported by the speaker support, the at least one speaker box having a front and a rear wall, and the speaker support being movable with the at least one speaker box mounted thereto from a first state, where the front of the at least one speaker box is behind a portion of the housing so that the front is hidden from view when viewing the front wall of the housing, to a second state, where the at least one speaker box is spaced from the housing and the front of the at least one speaker box, or at least a portion thereof, is unobstructed by the housing. With this construction, a manufacturer or assembler can install different speakers according to the end users preference and customize the system.

[0010] According to another embodiment, an audio visual system is provided comprising a housing having a front wall, a video display, at least one speaker box support coupled to the housing, and at least one speaker box suspended from the speaker box support, the at least one speaker box forming a space adapted to receive another speaker box and having a front and a rear wall, and the speaker support being movable with the at least one speaker box suspended therefrom, the at least one speaker box support comprising an extensible member, which can be, for example, a telescoping arm or sliding rail. The extensible arms provide a simple mechanism to spread out the sound field and the speaker box arrangement can facilitate custom speaker selection for the end user.

[0011] According to another embodiment, an audio visual system is provided comprising a first unit comprising a housing having a front wall, first and second side portions, and a video display; and a second unit adapted to be positioned adjacent to one of the side portions and comprising a speaker cabinet having a front wall, a speaker support coupled to the speaker cabinet, at least one speaker mounted to and supported by the speaker support, the speaker having a front and a rear wall, and the speaker support being movable with the speaker mounted thereto from a first state, where the front of the speaker is behind a portion of the speaker cabinet front wall so that the speaker front is hidden from view when viewing the front wall of the speaker cabinet, to a second state, where the speaker is spaced from the speaker cabinet and the front of the speaker is unobstructed thereby. The modular construction can facilitate system customization and the speaker having a hidden from view position and an extended position shares the advantages described above. This modular construction also facilitates system customization.

[0012] According to another embodiment of the invention, a speaker system is provided comprising a speaker cabinet having a front wall, a speaker support coupled to the speaker cabinet, at least one speaker mounted to and supported by the speaker support, the speaker having a front and a rear wall, and the speaker support being movable with the speaker mounted thereto from a first state, where the front of the speaker is behind a portion of the speaker cabinet front wall so that the speaker front is hidden from view when viewing said front wall of the speaker cabinet, to a second state, where the speaker is spaced from the speaker cabinet and the front of the speaker, or at least a portion thereof, is unobstructed thereby.

[0013] The above is a brief description of some deficiencies in the prior art and advantages of the present invention. Other features, advantages, and embodiments of the invention will be apparent to those skilled in the art from the following description, accompanying drawings, wherein, for purposes of illustration only, specific forms of the invention are set forth in detail.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

[0014] The accompanying drawings, which are incorporated in and form a part of this specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention. In the drawings:

[0015] FIG. 1 is a perspective view of a home entertainment system constructed in accordance with the principles of the present invention with speakers in a retracted state and hidden from view;

[0016] FIG. 2A is a perspective view of the home entertainment center of FIG. 1 with speakers extended from the cabinet in an extended state;

[0017] FIG. 2B is a perspective view of a modification of the home entertainment center of FIG. 2A where the speakers are suspended solely from speaker supports thereabove;

[0018] FIG. 2C is a perspective view of another modification of the home entertainment center of FIG. 2A where the speaker supports are provided solely below each speaker;

[0019] FIGS. 2D1, 2D2, and 2D3 schematically illustrate a variation of any of the foregoing embodiments where FIG. 2D1 shows sliding doors covering the video

display and the speakers hidden from view, FIG. 2D2 shows the sliding doors moved or extended to expose the video display, and FIG. 2D3 shows the speakers extended from the doors;

[0020] FIGS. 2E1-2E6 schematically illustrate another variation where FIG. 2E1 shows sliding doors moved or extended to expose the video display and the speakers extended from the doors, FIG. 2E2 shows speakers behind the doors and hidden from view, FIG. 2E3 shows the doors moved to a closed position where they cover the video display and the speakers behind the doors and hidden from view, FIG. 2E4 is a partial front view of the open configuration illustrated in FIG. 2E1, FIG. 2E5 is a rear view of the sliding door illustrated in FIG. 2E4, FIG. 2E6 illustrates a coupling variation, and FIG. 2E7 is a rear view of the speaker illustrated in FIG. 2E4;

[0021] FIG. 3A is a front elevational view of another embodiment of the invention with the speakers hidden from view and in a retracted state;

[0022] FIG. 3B is a front elevational view of the embodiment illustrated in FIG. 3A with the speakers in an extended state;

[0023] FIG. 4A is a rear elevational view of the embodiment illustrated in FIG. 3A with the speakers in the retracted state shown in FIG. 3A;

[0024] FIG. 4B is a rear elevational view of the embodiment illustrated in FIG. 3A with the speakers in the extended state shown in FIG. 3B;

[0025] FIG. 4C is a variation of the speaker drive mechanism shown in FIG. 4A with the speakers in the retracted state;

[0026] FIG. 4D illustrates the speaker drive mechanism of FIG. 4C with the speakers in the extended state;

[0027] FIG. 5A is an exploded view of the system illustrated in FIG. 3A;

[0028] FIG. 5B is a top sectional view taken along line 5B-5B of FIG. 4A;

[0029] FIG. 5C is a sectional view taken along line 5C-5C of FIG. 4B;

[0030] FIG. 6 is a front elevational view of a variation of the embodiment shown in FIGS. 3A and 3B with roller screens secured to the inner surface of each speaker;

[0031] FIG. 7 is a top sectional view of the embodiment shown in FIG. 6;

[0032] FIG. 8 is a front elevational view of a variation of the embodiment shown in FIGS. 6 with roller screens secured to the outer surface of each speaker;

- [0033] FIG. 9 is a further variation of the embodiment of FIG. 3A with speakers extendable in lateral and vertical directions;
- [0034] FIG. 10 is a block diagram of a remote control system for actuating any of the motor drive assemblies described herein;
- [0035] FIGS. 11A and B illustrate a further variation of the embodiment shown in FIGS. 3A and 3B where FIG. 11A shows the speakers in view when in the retracted state and FIG. 11B shows the speakers in an extended state;
- [0036] FIGS. 11C and 11D illustrate a variation of the embodiment of FIGS. 11A and B;
- [0037] FIG. 12A-D illustrate a modular entertainment center where FIG. 12A is a front elevational view of the components assembled and the speakers extended, FIG. 12B is a front elevational view of the components disassembled, FIG. 12C is a side elevational view of the entertainment center, and FIG. 12D is a partial front elevational view of the left side column illustrating a speaker in a retracted state in dashed line;
- [0038] FIG. 13 is a perspective partial sectional view of modular speaker system in accordance with another aspect of the invention;
- [0039] FIG. 14A is a front elevational view of the speaker system of FIG. 13 with the front panel removed and illustrating the system housing a speaker; and
- [0040] FIG. 14B is a front elevational view of the speaker system of FIG. 13 with the front panel removed and illustrating the system housing a speaker having a configuration different than that shown in FIG. 14A.

#### **DETAILED DESCRIPTION OF THE INVENTION**

- [0041] Before the present invention is described, it is to be understood that this invention is not limited to particular embodiments or examples described, as such may, of course, vary. The embodiments described herein are provided for purposes of example and are not intended to limit the invention.
- [0042] Referring to the drawings wherein like numerals indicate like elements, an audio visual system in the form of an entertainment center is shown in FIG. 1 and generally indicated with reference numeral 2. Home entertainment center 2 includes a housing 4, which can be in the form of a stand-alone cabinet as shown in FIG. 1.

[0043] Referring to FIGS. 1 and 2, housing or cabinet 4 houses a video display 6, which can be a component of a television as depicted in the illustrative embodiment, and left and right speakers 8L and 8R (FIG.2A) each having a front 8LF and 8RF, respectively. Other components also can be housed in cabinet 4. For example, the cabinet can house a center channel speaker 10 (FIG.2A), auxiliary left and right speakers 12L and 12R, and a plurality of other components on shelves 14 including, but not limited to, a receiver, VCR, CD, DVD, and/or a personal video recorder (PVR). A subwoofer (not shown) can be included and placed, for example, in the space occupied by one or more the shelves. The two upper shelves shown in drawings can be removable and/or vertically adjustable as is known in the art. The housing also can include upper doors 16 and lower doors 18 pivotally mounted thereto for concealing additional storage compartments.

[0044] FIG. 1 illustrates the audio visual system in a first state where the left and right speakers 8L and 8R and the optional center channel speaker 10 are hidden from view. Although not shown, sliding doors also can be provided to enclose or hide the video display when closed and to expose the video display when moved or opened. FIG.2A illustrates the audio visual system in a second state where the left and right speakers 8L and 8R are extended out from the cabinet by a desired distance via extensible members or telescopic rails and center speaker 10 is exposed via a conventional "flipper door." The extended and exposed speakers provide enhanced stereophonic or acoustic quality, which is especially desirable, when viewing programs that support multi-channel audio effects. This configuration provides most if not all one needs to enjoy the latest DVD movie or programming where the audio is being transmitted in a surround sound format. Accordingly, the system is well suited for space-limited room environments where there is really no or little room for floor standing speakers. When each speaker 8L and 8R is spaced the same distance from the cabinet 2, it is possible to optimize the stereophonic effect. Phantom rear speakers can be incorporated into the speaker boxes in any of the embodiments described herein to provide rear channel audio effects.

[0045] Referring to FIG. 2A, speakers 8L and 8R are mounted to speaker supports or telescoping arms 22L and 22R, respectively, which are mounted to housing or cabinet 4 or a frame within the housing with screws or other known fastener means. The telescoping arms are of conventional construction where each can have two

segments or members, one slidably disposed within the other as shown in FIG. 2A, or more than two segments or members. Thus, for example, three segments can be used. One segment can be fixed or secured to an inner portion of the cabinet with conventional fastening mechanisms as would be apparent to one of ordinary skill in the art. The fixed segment can be hidden from view with the remaining two segments being extendable therefrom such that they extend out from the cabinet, one slidably disposed in the other such as shown in FIG. 2A. The configuration of telescoping arms 22L and 22R, which form extensible speaker supports, is further shown in FIGS. 4A and 4B where they are incorporated into audio visual system 2'. The configuration where one telescoping segment is disposed in another also is illustrated in a three piece arrangement in FIG. 12D.

[0046] Although one telescoping configuration has been shown, it should be understood that other telescoping configurations can be used in any of the embodiments described herein. For example, one telescoping member can be slidably mounted to an exterior surface of the other member with which it cooperates. Further, the telescoping arms or members can be constructed so that the speakers, when mounted to the ends thereof can be sufficiently spaced from the cabinet to provide the desired effect. For example, in a cabinet having a height of 60 inches, a depth of 26 inches, and a width of 52 inches, telescoping arms or rails have been provided that extend beyond the left and right side of the cabinet by about 30 inches. However, it should be understood that the arms or rails can be made to extend more than that from the sides of the cabinet or less than that from the sides of the cabinet depending on the desired effect and space available.

[0047] The ends of the telescoping arms can be fixedly secured to speakers 8L and 8R so as to preclude relative movement therebetween. Alternatively, the ends of the telescoping arms can be provided with or coupled to speaker supports 24L and 24R that are rotatably mounted to the arms so that speakers 8L and 8R can be rotated to provide additional sound adjustment. Each rotating support can comprise a disc mounted to a bearing, which is secured to the end of an arm with a pin that is secured in the center bore of the bearing or with other fastening means. Commercially available turntables or swivel bearings also can be used. One example is a 4 inch TM4C swivel bearing provided by Triangle Manufacturing Company of Oshkosh, Wisconsin.



[0048] Although one example of an extensible speaker support is illustrated in FIG. 2A, it should be understood that other extensible members or supports can be used in any of the embodiments described herein. Examples of other extensible speaker supports include but are not limited to sliding members such as rails or pins that are coupled or fixedly secured to the speakers and slidably mounted to another member coupled or fixedly secured to the display housing or cabinet.

[0049] Referring to FIG. 2B, a modification of the home entertainment center of FIG. 2A is shown where the speakers are shown solely suspended from speaker supports thereabove.

[0050] FIG. 2C illustrates another modification of the home entertainment center of FIG. 2A where the speaker supports are shown supported solely by speaker supports therebelow.

[0051] As noted above, sliding doors also can be provided to enclose, cover or hide the video display and expose the video display when laterally moved away from each other. Specifically, the doors are mounted for sliding laterally toward each other and into contact to achieve a closed state and for sliding laterally away from each other to an open position to expose the video display for viewing. The telescoping arms 22L and 22R can be mounted to the doors so that when the doors are moved laterally away from each other, the left and right speakers 8L and 8R move with the doors. Once the doors are in an open state, the speakers can be further laterally spaced from doors via the telescoping arms to the desired position. Such an arrangement is schematically illustrated in FIGS. 2D1, 2D2, and 2D3 where FIG. 2D1 shows the sliding doors "D" closed and the video display 6 and speakers 8L and 8R hidden from view, FIG. 2D2 shows the sliding doors moved to an open position with the video display exposed and the speakers still hidden from view, and FIG. 2D3 shows the doors open and the speakers extended therefrom and the video display exposed. Although telescoping arms have been described as a mechanism to move the speakers from one state where they are hidden from view to another state where they are unobstructed, it should be understood that other mechanisms can be used. For example, the speakers can be pivotally mounted to sliding doors "D."

[0052] Referring to FIGS. 2E1-2E6 another variation is schematically shown where FIG. 2E1 shows sliding doors D moved or extended to expose video display 6 and

the speakers extended from the doors. FIG. 2E2 shows speakers 8L and 8R behind doors D and hidden from view. FIG. 2E3 shows doors D moved to a closed position where they cover the video display with speakers 8L and 8R behind the doors and hidden from view.

[0053] FIG. 2E4 is a partial front view of the open configuration shown in FIG. 2E1 illustrating the speaker and door sliding mechanism. Each door includes a pin "P" extending from its upper and a pin P extending from its lower end surface. Each door pin P is slidably disposed in slot, groove or track "T1," which can be formed in an upper and lower portion of the display housing or cabinet. Alternatively, it can be formed in two members, one secured to an upper portion of the display housing or cabinet and the other secured to a lower portion of the display housing or cabinet. Each speaker also includes a pair of pins P. One pin extends from an upper front portion of the speaker and the other pin extends from a lower front portion of the speaker. Each pin is slidably disposed in slot, track or groove "T2," which is formed in the rear of each speaker door as shown FIG. 2E5.

[0054] The slot and pin configurations can be made as is well known in the art. They can comprise straight pins and grooves. Alternatively, the slot and pin configuration can be as shown in FIG. 2E6 where each pin, generally indicated with reference character P', can have an enlarged head so that it does not fall out of the C-shaped groove or track. The grooves or tracks can have enlarged openings at the inward ends relative to the display housing to facilitate insertion of the pins in a direction normal to the length of the track or groove. Alternatively, the inward ends can be open. The pins can be made of any suitable material. One suitable example is a metal pin having a vinyl covering.

[0055] As in any of the embodiments described herein, speaker wires can extend from the audio component in the display housing or cabinet to the speakers with sufficient slack to allow full speaker extension. As shown in FIG. 2E7, the speakers can have conventional speaker wire connectors 8C.

[0056] Referring to FIGS. 3A and B, 4A and B, and 5A-C, another embodiment of the invention suitable for wall mounting or mounting on a pedestal is shown incorporating a flat panel video display. Audio visual system 2' includes a housing 4', which houses a flat panel video display 6' and/or forms a frame for the flat panel video display 6'. Flat panel video display 6' can be in the form of a television, such

as a plasma, liquid crystal or high definition television, or it can be in another form, such as a flat panel monitor. The housing further houses or supports left and right speakers 8L and 8R, each having a front 8LF and 8RF, respectively.

[0057] FIG. 3A shows the front of the audio visual system 2' in a first state where the left and right speakers 8L and 8R are disposed behind portions of the housing and hidden from view when viewing the system from the front. FIG. 3B illustrates the audio visual system 2' in a second state where the left and right speakers 8L and 8R are extended out from the housing by a desired distance via telescopic rails 22L and 22R. Required receivers and components for the flat panel display and speakers can be mounted on the housing or placed in a separate housing that can be wall or floor mounted.

[0058] Referring to FIGS. 4A and 4B, speakers 8L and 8R are mounted to speaker supports or telescoping arms 22L and 22R, respectively, in the same manner as described above in connection with audio visual system 2. Thus, rotatable speaker supports or swivels as described in connection with the foregoing embodiment and indicated with reference characters 24L and 24R also can be used. However, the manner in which the telescoping arms are secured to the housing differs in the illustrative example. Further, a drive mechanism can be provided to move the speakers as will be described in more detail below.

[0059] Referring to FIGS. 5A-C, housing 4' comprises frame or bezel 30, mounting strips 32, and support plate or bracket 34. Bezel 30 is secured to video display 6' by conventional means and can be part of a commercially available assembly comprising a flat panel video display with a bezel or frame. Mounting strips 32 are secured to the back of video display panel 6' with conventional fastening means. Strips 32 come installed on some commercially available flat panel displays. Strips 32 are provided with threaded holes or other fastening means to secure the display to support plate or bracket 34. In the illustrative embodiment, fasteners 36, which can be screws, are shown securing support plate or bracket 34 to mounting strips 32 (FIGS. 4A and 4B). The outer telescoping arm segment of each telescoping arm pair 22L and 22R is secured to the bracket with glue or fasteners or other means known to those of ordinary skill in the art. Although one bracket assembly configuration has been shown other configurations can be used as well. For

example, the bezel can be secured to plate or bracket 34 as opposed to being directly secured to video display 6'.

[0060] Any of the audio visual system embodiments described herein can include a drive to move the speakers synchronously or independently of one another. The audio visual system in any of the embodiments can include a rack and gear drive as shown in FIGS. 4A and 4B, which can be configured to have either speaker move the same distance as the other when one of the speakers is pulled laterally outward to the position shown in FIG. 4B or pushed laterally inward to the position shown in FIG. 4A. With such a configuration, the speakers remain spaced the same distance from the housing when either one is pulled or pushed laterally. This provides a predetermined balancing of the speakers relative to the housing and can provide the desired acoustic results with minimal effort. According to the illustrative embodiment shown in FIGS. 4A and 4B, the drive comprises toothed arms or racks 42, each having an end secured to one of the speakers 8L or 8R via a bracket 44 or other suitable means, and its toothed portion meshing with gear wheel or pinion 40, which is rotatably mounted or coupled to bracket 34. The end of each arm 42 that is secured to a respective speaker can be mounted thereto with conventional hardware to pivotally couple the end of the arm to the speaker and allow speaker rotation if desired. Such hardware can be provided on the rear of the speaker or the side of the speaker facing the display. For example, a conventional hinge having a pair of mating hinge plates and a pin pivotally coupling the plates can be used. One hinge plate can extend from the end of arm 42 to be secured or coupled to the speaker and the other hinge plate can be secured to the speaker side facing the display. It should be understood, however, that such hardware and/or speaker rotation is optional. A plurality of tracking rollers 38 also can be rotatably mounted to bracket 34 to support and/or guide toothed arms or racks 42. As a further option, a motor or drive (e.g., a thin or pancake style motor) can be mounted to bracket 34 and gear wheel 40 coupled thereto to provide a power driven speaker drive mechanism.

[0061] As described above, the drive mechanism can be configured to move the speakers independently of one another. Referring to FIGS. 4C and 4D, audio visual system 2'' is shown. Audio visual system 2'' is the same as audio visual system 2' with the exception that it incorporates an alternative drive configuration, which can

drive or displace one speaker independently of the other. In this case, two gear wheels or pinions 40 are rotatably coupled to bracket 34, one for each toothed arm or rack 42. A motor also can be provided as described above to provide a power driven speaker drive mechanism. In this manner, a motor can be provided for each gear wheel to independently power each gear wheel. With this arrangement. One can actuate one motor to move one speaker, while allowing the other speaker position to remain unchanged. Alternatively, one can actuate both motors to move one speaker inwardly and the other outwardly. Variable speed motors also can be used so that speakers can be moved at different rates of speeds.

[0062] Although various embodiments described herein are shown with drive mechanisms, it should be understood that they need not include such mechanisms. Further, other drives than those shown can be used. For example, motorized spiral gear or auger type drives or belt drives can be used in lieu of the illustrated rack and pinion drive to move the speakers outwardly or inwardly. Such drives also can be configured to move the speakers synchronously or independently of one another as described above.

[0063] Referring to FIGS. 6 and 7, a further audio visual system is shown and generally indicated with reference numeral 2'''. Audio visual system 2''' is the same as audio visual system 2' or 2'' with the exception that audio visual system 2''' further includes two screens 50 that cover at least a portion of the telescoping arms, and toothed arms or racks if included, and can also cover speaker wires or any other components between the speakers and the video display housing. Each screen is coupled to a spring loaded roller 52 that is mounted to bezel or frame 30. Each uncoiled end of each screen is secured to an inner wall surface of one of speakers 8L and 8R so that the screens are carried with the speakers when the speakers are laterally extended. When the speakers are retracted to a position behind the bezel, the spring loaded rollers rewind the screen therearound. Screens 50 can comprise any suitable material including opaque, translucent or transparent materials. The material may have various patterns or designs including, but not limited to, solid, striped, or repeated circle designs. It can have artwork, pictures or prints incorporated therein or thereon. When it is desirable to completely hide the telescoping arms, racks 42, and or speakers, opaque materials generally are preferred. Although a rolling screen configuration has been illustrated, it should be

understood that other screen configurations can be used. Other screen configurations include but are not limited to, for example, accordion configured screens. The accordion configuration facilitates expansion and contraction to provide the desired coverage of components.

[0064] Referring to FIG. 8, another audio visual system 2'''' is shown. Audio visual system 2'''' is the same as audio visual system 2''' with the exception that in audio visual system 2'''' the uncoiled ends of the screens are secured to the outer surface of the speakers to entirely cover the speakers, telescoping arms, and the optional rack and gear drive mechanisms described above.

[0065] Referring to FIG. 9, a further embodiment is shown and generally indicated with reference numeral 2'''''. Audio visual system 2''''' is the same as Audio visual system 2'''' with the exception that upper and lower speakers 8U and 8L and telescoping arms 22U and 22L are provided and bezel 30' is enlarged on the upper and lower sides to accommodate hiding upper and lower speakers 8U and 8L therebehind. The drive mechanisms described above also can be incorporated into this embodiment where the desired number of gears can be used to move toothed arms or racks 42. For example, the lateral drive mechanism can be a one or two gear system as described above in connection with FIGS. 4A-D. The vertical drive system also can incorporate the single or dual gear drive system and any combination of the mentioned lateral and vertical drive systems can be used. Further, screening can be provided as shown in FIGS. 6-8.

[0066] A remote control system for driving the powered speaker drive mechanisms described above is diagrammatically shown in a block diagram in FIG. 10. The remote control can include a conventional signal transmitter and actuator therefor to send a signal to a signal detector that is coupled to the motor to provide forward and reverse control signals to the motor which is separately coupled to suitable power. Thus, actuation of the signal transmitter can actuate the drive assembly any of drive assembly motors 40 to move so as to extend or retract the left, right, upper, or lower speakers. According to one variation, the remote control circuit can be controlled by voice recognition.

[0067] FIGS. 11A and 11B illustrate a further embodiment, which is the same as system 2' as shown in FIGS. 3A and 3B with the exception that the extensible or telescoping arms are configured so that the speakers remain in view when in the

retracted state. For example, the length of the toothed portion measured from the free end of each extensible arm can be shortened to reduce the distance that the each speaker moves. As is the case with system 2', the bracket assembly of FIGS. 5A-C and/or any of the drive mechanisms described above (e.g., the drive mechanisms shown in FIGS. 4A-C) or screen arrangements described herein and illustrated in FIGS. 6-9 can be incorporated into this embodiment. The embodiment illustrated in FIGS. 11C and 11D is the same as that shown in FIGS. 11A and 11B with the exception that it does not include frame or bezel 30 around the flat panel or plasma display. Otherwise this embodiment, like the embodiment of FIG. 11A and 11B, can include the bracket assembly illustrated in FIGS. 5A-C and any of the aforementioned drives, screens and related mechanisms. A mounting bracket can be secured to plate or bracket 34 when used to facilitate wall or pedestal mounting or mounting the display in a cabinet.

[0068] According to another embodiment of the invention, a modular system is provided where the telescoping speakers are provided in separate or modular speaker cabinets. Referring to FIGS. 12A-D, an illustrative example of a modular entertainment center or audio visual system is shown and generally indicated with reference numeral 200. System 200 includes a center cabinet 202C, which houses a video display such as video display 6. Center cabinet 200C can include shelves and can house audio visual components, including a center speaker mounted in a flipper door as described above in connection with cabinet 4. However, in this embodiment, the extendable speakers are mounted to left speaker cabinet 202L and right speaker cabinet 202R. In the illustrative embodiment, speaker 8L is telescopically mounted to left speaker cabinet 202L and speaker 8R is telescopically mounted to right speaker cabinet 202R in a manner similar to any of the embodiments depicted in FIGS. 2A-C so that each speaker can be moved from a first state where it is behind the front wall of a respective speaker cabinet and hidden from view (FIG. 12B-D) to a second state where it is moved to a position spaced from the cabinet with its front unobstructed by the speaker cabinet front wall (FIG. 12A). As described above, the swivel mounts are optional. Thus, for purposes of example, FIG. 12A illustrates the system where the swivel mounts (24L or 24R) are not included and the telescoping arms are attached directly to the rear side of speakers 8L and 8R. FIG. 12D, however, is an example where the

telescoping arms can be coupled to the speakers through swivel mounts 24R and/or 24L (not shown). Although FIG. 12D illustrates extensible member or telescoping arm 22R with three telescoping segments, one can vary the number of segments. In addition, a drive mechanism can be provided for each speaker cabinet to move the speakers inward and outward. For example, a drive mechanism as illustrated and described in connection with FIGS. 4C and 4D can be used where one rack and pinion assembly is coupled to one speaker and speaker cabinet combination and the other rack and pinion assembly is coupled to the other speaker and speaker cabinet combination. Each pinion also can be provided with a motor or drive. Although a three piece system is shown (center video display cabinet with right and left speaker cabinets), one or more speaker cabinets can be provided separately to compliment an existing cabinet.

[0069] According to another embodiment, a modular speaker system is provided with extendable speaker boxes, which can be coupled through telescoping arms to a video display as in any of the embodiments described above. Each speaker box is configured to receive one or more speakers therein or to receive a speaker box containing one or more speakers. This construction facilitates quick speaker interchangeability or customization.

[0070] Referring to FIG. 13, a perspective partial sectional view of a modular speaker system in accordance with the invention is shown. Modular speaker system 300 includes outer speaker box 302, which is adapted to receive inner speaker box 304, which can correspond to either speaker 8L or 8R, which can comprise one or more speakers or speaker cones mounted in a box. Outer speaker box 302 can be provided without inner speaker box 304 or it can have inner speaker box 304 installed therein. Inner speaker box 304 includes one or more speakers or speaker cones 304a and housing or box 304b. Outer speaker box 302 can have one or more speaker supports such as top and bottom shelves 306 and 308 for supporting or restraining inner speaker box 304. The shelves can be supported by elongated members or brackets 310, which can be positioned at the desired location and secured to the inner walls of outer box 302 as shown in FIGS. 13, 14A and 14B. In FIG. 14A, the brackets are positioned in a different position than their position in FIG. 14B in order to accommodate a differently sized or configured inner speaker



box. The shelf supports also can be arranged so that the shelves minimize or eliminate movement of inner speaker box 304.

[0071] Elongated members or brackets 310 can be secured to the outer box using fasteners or glue as is known in the art. Alternatively, adjustable bracket means can be used. For example, holes can be drilled into the inner walls of outer speaker box 302 and pegs inserted therein to support the shelves. The holes can be arranged to provide alternative locations for the pegs so that the shelves can be positioned at different locations to accommodate speakers of different size. Alternatively, a plurality of vertical arranged slots can be provided in opposed inner wall surfaces to form diametrically opposed and horizontally aligned slot pairs, each sized to receive a respective shelf. The adjustable peg and adjustable slot shelf holding means are conventional adjustable shelf designs, which are known in the art.

[0072] A conventional speaker cover 312, which can comprise nylon mesh, can be placed on or form the front of the outer speaker box. A plurality strips, such as strip 320, can be secured to opposed inner walls of outer speaker box 302 to engage inner speaker box 304 and secure inner speaker box 304 in speaker box 302 so that speaker box 304 does not rattle and to absorb vibrations. One strip can be arranged to engage a forward end of one side of the inner speaker box. Another strip can be arranged to engage a rear end of the same side of the inner speaker box. Two more strips can be arranged to similarly engage the opposite side of the inner speaker box. The strips can comprise or be made of neoprene or any other suitable material. The thickness of the material can vary as would be apparent to one skilled in the art. Depending on the size of the speaker driver and inner speaker box 304, which houses the driver, the thickness of the strip can vary. One example can be a 1/8 inch thick neoprene strip. A rear plate, which can have a central cut out portion, such as rear plate 314, can be secured to or form the back of outer speaker box 302 to secure inner speaker box 304 therein. Fasteners 316 can be used to secure rear plate 314 to a rear portion of outer speaker box 302.

[0073] End housings or caps 318 can be rotatably coupled to the main housing of outer speaker box 302 using rotating speaker supports or swivel mounts 24L and/or 24R as described above. Shelves 322 can be used to support speaker supports 24L and/or 24R. One or more telescoping arms 22L can be coupled to end caps 318 as shown in FIG. 13. The other end of each telescoping arm is mounted to a video

housing as described in any of the preceding embodiments so that the speakers can be extended therefrom. Although only one outer speaker box arrangement is shown, another can be provided and similarly coupled to the other side of an audio display as described in any of the foregoing embodiments.

[0074] While the invention has been described with reference to specific embodiments, the invention by no means is limited to the specific embodiments illustrated and described herein. It is recognized that departures from the disclosed embodiments may be made within the scope of the invention and that obvious modifications will occur to a person skilled in the art. In addition, many modifications may be made to adapt a particular situation, material, composition of matter, process, process step or steps, to the objective, spirit and scope of the present invention. All such modifications and equivalents are intended to be within the scope of the claims appended hereto.